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A REFLOW CASE STUDY

ENERGETIC EFFORTS IN CLUJ-NAPOCA

Cluj-Napoca's Energy Transition

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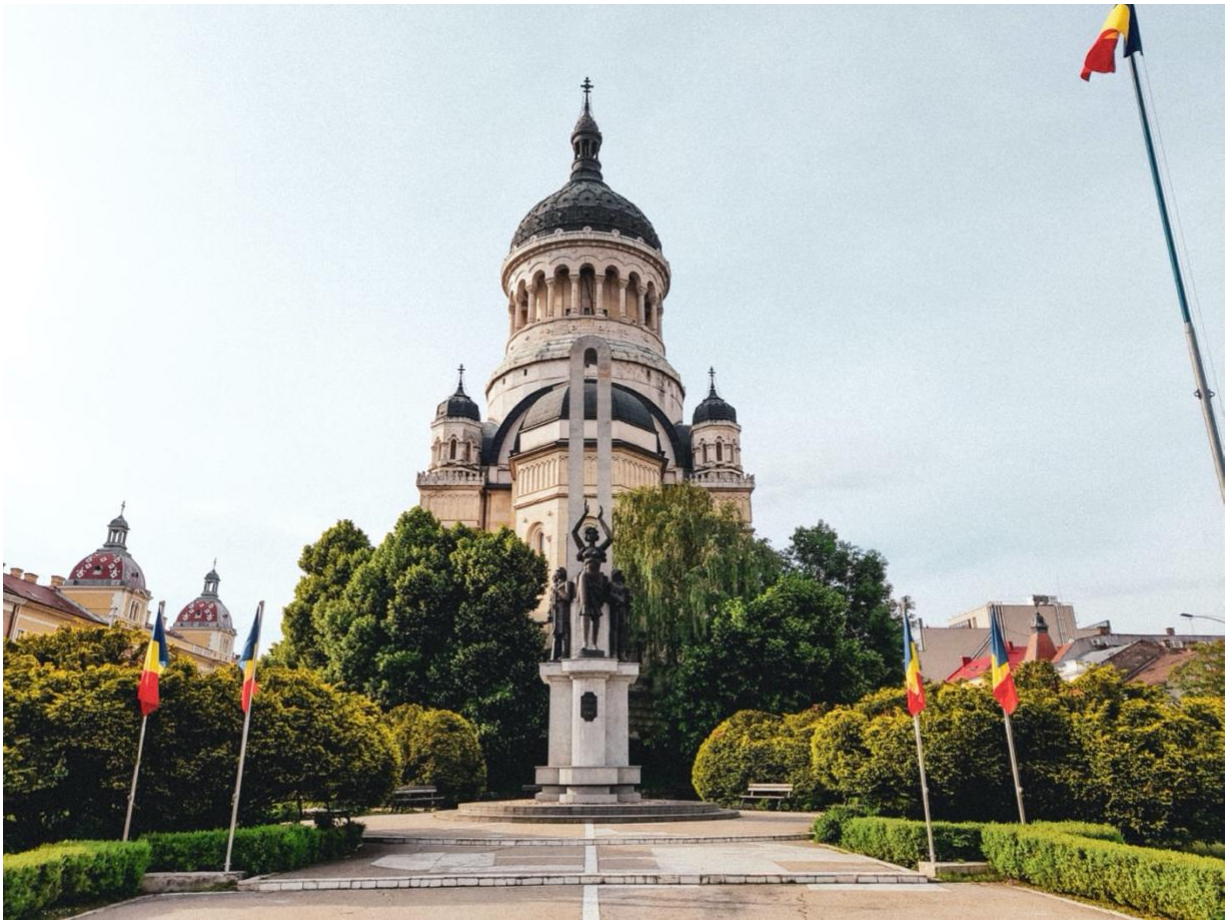

Figure 1: Photo by Lucut Razvan on Unsplash

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Introduction

At the tail end of a three-month journey, the Cluj-Napoca pilot coordinator, Mihai Barbu, found himself running on fumes after spending a good chunk of his time trying to build an Energy Dispatch for a solution that his team was developing. The Cluj-Napoca pilot team was made up of 3 organisations including a research centre, an IT cluster, and the municipality. They were brought together as a pilot city in the 3 year EU funded project, REFLOW, seeking to co-create circular and regenerative cities. As a REFLOW pilot city, the Cluj-Napoca pilot team was focused on the way energy was being produced, consumed, and wasted. Through REFLOW, the Cluj-Napoca pilot was obliged to deliver tested solutions that tackled the challenges of energy efficiency in the city while also contributing to long-lasting impact within the city's energy sector.

The Cluj-Napoca pilot team had set out to develop two core solutions which they needed to deliver at the end of the REFLOW project: (1) The Retrofit Kit and (2) The Energy Dashboard. The two solutions worked hand-in-hand with each other. The Retrofit Kit was a collection of different energy efficiency components that could be installed in existing buildings that were dealing with the challenges of high amounts of energy waste and consumption. The Energy Dashboard would be a technological solution that would take energy consumption data and visualise this information in an understandable and easy way so that citizens or those with a non-technical background could know how much energy was being consumed. The Energy Dashboard would also help to pinpoint buildings where there were high amounts of energy waste and consumption and therefore, important points for the Retrofit Kit to be installed to help increase a building's energy efficiency. The timeline of the REFLOW project had required that the Cluj-Napoca team have a prototype developed in the next month for feedback and testing.

Over the past three months, the Cluj-Napoca pilot team had managed to develop the Retrofit Kit which was ready to go. However, the development of the Energy Dashboard had not gone as smoothly. While the technological development of the Energy Dashboard was nearly complete, the only remaining piece was the actual energy consumption data that would feed automatically into the solution. This required the Cluj-Napoca pilot team to develop an Energy Dispatch. The Energy Dispatch was a database of real and updated energy consumption data in the Municipality of Cluj-Napoca. This Energy Dispatch provided real-time, hard data on the reality of energy consumption in the city, and which would help the team to increase the city's energy efficiency and to reverse the trend of increasing energy consumption. To make the Energy Dispatch work and to ensure its financial sustainability in the future, the energy consumption data needed to be fed into the database automatically.

The owner of the energy consumption data and the organisation who could provide automatic data was the energy distributor. Over the course of 3 months, Mihai relentlessly called several contacts

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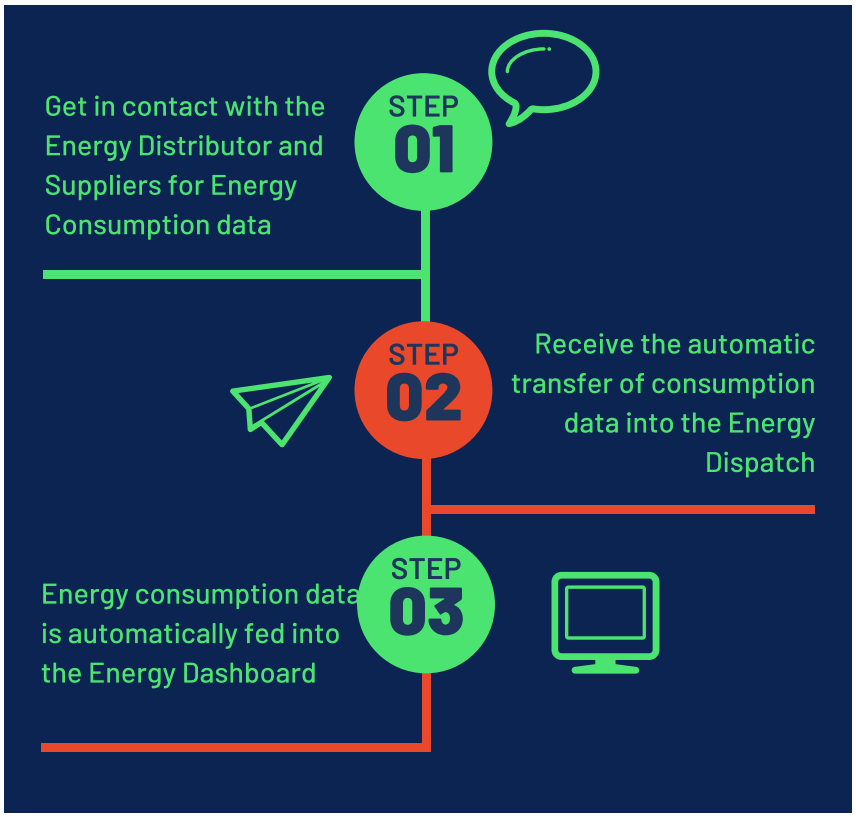
at the energy distributor in order to obtain the automatic transfer of energy consumption data. Since the energy distributor was a large and extremely rigid and bureaucratic organisation, Mihai had spent the majority of his time, just, trying to get into contact with the right person to speak to. Each communication attempt with the energy distributor ended up with a new person in the organisation to contact and with the Cluj-Napoca pilot team finding themselves in a labyrinth of bureaucratic structures. After each unsuccessful attempt, Mihai and the rest of the Cluj-Napoca pilot team were beginning to feel defeated.

After months of back and forth, Mihai Barbu was finally able to get a hold of the energy consumption data officer, Ioana Matei, at the energy distributor. To Mihai's dismay, the answer was disappointing. Ioana informed Mihai that the energy distributor did not want to automatically release their energy consumption data into the Energy Dispatch. This was for two main reasons: (1) the automatic transfer of energy consumption data was not a legal obligation and therefore not a responsibility that they needed to uphold and (2) they did not want to incur any additional costs outside of their already strict and agreed upon budget.

But, for the Cluj-Napoca pilot team to implement the Energy Dashboard in a way that could be future-proof, they needed to have automated energy consumption data flowing into the Energy Dispatch.



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With the deadline of their solution needing to be developed in one month's time, Mihai Barbu had to come up with the next steps for the Cluj-Napoca pilot. The Cluj-Napoca pilot needed this solution to be developed, not only to deliver on what they promised within the REFLOW project, but to also address the challenges in the city's energy sector. With climate change becoming an increasingly important factor to address and with the recent energy crisis hitting the homes of citizens across Romania and Europe, addressing energy efficiency, consumption, and waste was more prevalent than ever. With the development of the Energy Dashboard, the Cluj-Napoca pilot team believed that they would be able to generate long-lasting impact in not only the city, but across Romania and other European cities and beyond.

With a pressing deadline in a month to finish the development of this technological solution alongside the overarching energy and climate crisis looming in the background, Mihai needed to figure out what the Cluj-Napoca pilot team was going to do. With the rejection and reasonings from the energy distributor regarding the automatic release of data, Mihai sat in his office at the Municipality of Cluj-Napoca and wondered: How should he and his team approach this challenge? Were there strategic arguments that the Cluj-Napoca pilot team could make to convince the energy distributor to automatically release their data for the sake of a more sustainable and circular future? Were there possible political leverage points they could tap into to? Or was this a lost cause, and if so, what should they do?

Energetic Efforts in Romania

In 2021, the European Union had continued to push the importance in sustainable energy as a key component in mitigating climate change. With buildings being accountable for generating 40% of total energy consumption and 36% of greenhouse gas emissions, they were key targets for energy interventions. The EU had outlined five key aspects that would lead towards more sustainable energy: energy security, decarbonisation, energy efficiency, the energy internal market, and research, innovation and competitiveness. On the global stage, the EU was dedicated to showcasing their energy transition across the region by achieving the targets set out in the Paris Agreement, of which the EU was legally bound to. This included limiting global warming to below 2 degrees Celsius with the further efforts to keep the rise in temperature within a 1.5 degree Celsius limit. Since Romania was also part of the EU, they were too legally bound to these targets, which they stipulated in the nation's Integrated National Energy and Climate Plan (INECP). The targets which needed to be reached by 2030 according to the INECP[i] were:

- 44% reduction in Romanian greenhouse gas emissions (compared to 2005 levels)
- 30.7% share of energy from renewable sources

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- 45.1% decrease of primary energy consumption and 40.4% decrease in final energy consumption
- Increase internal energy sources and ensure a diversified energy mix (30.3% hydro; 21.0% wind; 20,2% solar; 11.8% natural gas; 7.9% solid fuels; 7.9% nuclear; 0.4% crude oil and petroleum products; 0.5% biomass)

Cluj-Napoca

Cluj-Napoca was located in the north-western part of Romania, 450 kilometres northwest of the Romanian capital, Bucharest. Cluj-Napoca was one of Romania's largest and fastest growing cities in 2021. In recent years, the city had grown both economically, becoming Romania's hailed IT capital, and demographically, accounting for 392,000 inhabitants. With this growth and development came also some challenges. First, more housing was needed to support the influx of population into Cluj-Napoca. Second, with economic growth and an increasing population, energy consumption was on the rise in the city. The latter was being addressed in the Municipality of Cluj-Napoca's Action Plan, which set out to reverse this increasing energy consumption trend through the adoption of more efficient and circular solutions into the municipality's district heating and electric consumption. Prior to joining the REFLOW project, the Municipality had already taken steps towards increasing energy efficiency and mitigating climate change. These initiatives included transitioning their bus fleets to low-carbon vehicles and creating energy efficiency awareness campaigns for the local communities across the city.

Thus, Cluj-Napoca's most recent efforts on sustainability and energy efficiency had not fallen short. Additionally, in 2011, Cluj-Napoca became a member of the Covenant of Mayors (CoM), the world's largest movement for local climate and energy actions. The CoM was concerned with action at the local level within the competence of the local authority. Within this framework, Cluj-Napoca was committed to reduce energy consumption and emissions. The plan and actions to achieve this objective were described in the Sustainable Energy Action Plan[ii] (SEAP) whereby the city of Cluj-Napoca agreed to cut off energy consumption and greenhouse emissions by 20 percent by 2020 as compared to 2011 levels. Similarly, under the SEAP, Cluj-Napoca agreed to increase the share of renewable energy by 8 percent. The SEAP included interventions in the energy consumption and sustainability of buildings and infrastructure, e-administration, transportation, local electricity and heating production, internal organisation, communication and cooperation of citizens and stakeholders, and public procurement. Continuing its efforts towards more efficient energy consumption, Cluj-Napoca, joined the EU Horizon 2020 project REFLOW in June 2019.

Cluj-Napoca Pilot Action Plan

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The team of three organisations, an IT cluster, a research institute, and the Municipality of Cluj-Napoca all came together to form the Cluj-Napoca pilot team. In REFLOW, the Cluj-Napoca pilot team wanted to build upon these previous efforts and momentum by focusing on the improvement of energy efficiency and consumption patterns in the municipality's buildings. Since national legislation regarding energy was out of reach for Romanian local authorities, the Cluj-Napoca pilot team would leverage on both the Integrated Strategic Plan and the National Energetic Strategy for 2030, which, among others, set energy related strategic objectives. Within REFLOW, the Cluj-Napoca pilot set the following overall goals:

- To assess how the measures taken to date had impacted the energy efficiency of selected buildings and involve the identified stakeholders in implementing and furthering those measures;
- To disseminate the information gathered at household and business level; to encourage different actors in the ecosystem to propose new ideas regarding renewable energy sources to be integrated in the city's strategy for a circular economy.
- To educate and increase the awareness of citizens on their energy consumption and on circular economy
- To establish Cluj-Napoca as a 'lighthouse city' in Romania

Cluj-Napoca's Pilot Action Plan started from the exploration and mapping of the energy production and consumption in the city itself. In particular, the Cluj-Napoca pilot team needed to build their Energy Dispatch, which was the key input for the Energy Dashboard.

The Team's Data Requirements

The pilot team had two vital requirements for the development of the Energy Dispatch: (1) the transfer of data needed to be done automatically and (2) they needed consistent data for all consumption points in the city. These two necessities were mostly based on the future sustainability of their solution.

First, without the automatic transfer of data, the team could not feasibly generate a viable product for the future. This was because without automatization, too many resources would be spent on manually extrapolating energy consumption data for every single consumption point in the city - and there were a lot. At the time, the team was able to access publicly available consumption data which the sole energy distributor, who was also state-owned, published as open data through their legal mandate. However, the open data could only be processed manually and was thus unfeasible.

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Second, the team needed to have consistent data for all consumption points for now and in the future. A guaranteed source of this consumption data well into the future would be from the energy distributor who Mihai had been contacting for months and who had given him a negative answer. Presently, the team had only been able to receive the automatic transfer of data from the current energy supplier under tender with the Municipality. This was a problem because there were many energy suppliers in Romania, and they all had many different ways of collecting and organizing their data. As a result, the datasets were not uniform and needed to be organized – resulting in the use of increased resources to manage this process. Moreover, the public tender for the energy supplier in the Municipality of Cluj-Napoca changed on a yearly basis. With a new public tender being released every year, it was common that the Municipality changed their energy supplier annually. It was clear to Mihai that at this point the key actor they needed to act upon was the energy distributor.

Data and Circular Economy Transitions

The role of data in circular economy transitions was important. Having access to data provided important decision-making tools for using resources efficiently and for understanding future resource supply and demand. In relation to circular economy, data also provided the bridging infrastructure for organizations to understand the ways that materials or, in Cluj-Napoca's case, energy streams, were being consumed and wasted and allowed actors to capitalize on new technological innovations.

Barriers to Data Sharing

Despite its importance in facilitating the transition towards circular economy, there were several barriers to the sharing and release of data across various organisations. In general, the barriers to data sharing consisted of four key areas: value case, technical, legislative, and knowledge and culture[iii].

Value Case	• Lack of understanding of holistic value • Lack of willingness to invest based on current incentives
Technical	• Siloed data bases • Lack of data interoperability • Poor data quality • Data security and privacy challenges
Legislative	• Lack of clear legislation • Lack of incentivizing legislation • Presence of inhibiting legislation
Knowledge and Culture	• Lack of knowledge of circular economy and data sharing • Scepticism towards data sharing and lack of trust

Table 1: Barriers to Data Sharing (Source: Nordic Innovation, 2021)[iv]

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Value Case

Many organisations lacked an understanding and ability to identify the advantages associated with releasing their data for circular economy transitions. For many, it was hard to imagine the role they could play and how they could use this to their advantage if they released their data. As a result, these organisation showed a lack of willingness to facilitate the sharing of data. Showcasing successful small-scale projects and informing on the added- and shared-value the allotment of data could provide the potential to surpass this barrier.

Technical

Roadblocks in the technical sphere included data that was of poor quality, insufficient technical abilities in the organisation, lack of data interoperability, isolated databases, and data security issues. Moreover, the facilitation of data sharing was extremely resource extensive as individual agreements were required every time for each case of data release. Collaborative partnerships with organisations who have the authority to release their data and those who have the technical know-how provided important work-arounds to move past technical barriers. These could, in essence help to develop shared or interoperable platforms that could avoid the challenges of isolated data.

Legislative

Legislation could work as both a barrier and an enabler to the release of data. At the time, there was no common EU process for the sharing and collection of data and thus, there was no real incentive or pressure for organisations to share any data that they had. Additionally, implications of regulations in place such as GDPR, complicated the legislative facilitation of data release.

Knowledge and Culture

Connecting the concept of circular economy to data was not always intuitive to all organisations. This disconnect would be fuelled by an overall lack of understanding of the circular economy and the role of data in circular transitions. Other possibilities to lack of interest in data sharing were also underpinned by the organisation's culture and what they wanted and didn't want to release to the outside world. In these cases, trustworthiness played a role in the release of data.

Understanding the Political-Economic Structure in Romania

Following the 1989 revolution, Romania began its transition from a communist regime into a democratic society – encompassed by the shift from a totalitarian to a democratic government and from a planned to a competitive market economy[v]. With this economic transition, Romania's structural reforms sought to reduce the role of the state in the economy and open up to more private operations. As such, the country's socioeconomic condition began to flourish and as of

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2007, Romania had been a Member State of the European Union (EU). Despite Romania's structural reforms and accession into the EU, the government was still a key player in the economy, characterized by state-owned enterprises influencing industries and acting as the sole customer, supplier, or competitor[vi]. With these conditions, many faced efficiency and bureaucracy challenges when it came to having to interact with state-owned enterprises.

The Energy Suppliers

There were numerous energy suppliers within Romania, with the majority of them being privately run. Because the energy suppliers were private, they tended to be more flexible and dynamic as opposed to its public counterparts. On the other hand, since the energy suppliers were privately run, they were financially motivated and did not want to lose out on profits associated with decreasing energy consumption. At the same time, they were concerned with their social and environmental image amongst their customers, the municipalities across Romania. Every year, Romanian municipalities held public tenders for the energy supplier, which would provide the energy for the cities' citizens over the year. The winners of the public tenders were chosen based on price and their social and environmental commitments falling in line with the specific municipalities' interests and goals.

Since there was a new public tender every year for the Municipality of Cluj-Napoca's energy supplier, there was a big chance that there would be a different energy supplier from year to year. This was a huge challenge for the Cluj-Napoca REFLOW pilot team. While the energy suppliers were more dynamic and willing to provide the automatic transfer of energy consumption data, if they changed every year, they would have to go through the same manual procedure every year to call, make an agreement, and collect the data from the potential energy supplier for Cluj-Napoca that year. In the long-run, this method was highly inefficient and feasibly unsustainable.

The Energy Distributor

There was one state-owned (48,8% owned by the Romanian State) energy distributor in Romania which was also partly privately-owned (50,2% privately-owned)[vii]. It had been on the Romanian energy market for over 120 years and was therefore well-established and very important in the energy sector. However, because of its public ownership, the energy distributor was rigid, and it was not easy for them to be dynamic or adapt. The energy distributor was responsible for operating electricity grids across Romania. They had metering systems for all the final consumers of energy which they used to supervise and control the ways in which energy flowed to the different consumption points across the country.

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Mission, Vision, and Values

The driving mission underpinning the energy distribution sought to provide energy for anyone, at anytime and anywhere. In contrast to their rigidity, their vision focused on becoming a promoter of electrification and green energy while also being innovative and flexible in new approaches. Their values were outlined across four key areas: (1) trust, (2) competence, (3) safety, and (4) sustainability[viii].

Social Responsibility in the Organisation

The energy distributor had also made social responsibility an important element to the organisation. The organisation aimed to contribute to and to further progress their civic duty to Romania's development and future. Social responsibility was administered through the financing of projects to help Romanian communities and to donate to organisations carrying out projects which provide people with increased access to health, culture, and education. The energy distributor also placed energy efficiency at the core of their operations through educating both employees and citizens on being respectful to the environment.

> *"Globally, humanity is facing the challenge of finding sustainable, environmentally friendly and accessible solutions. Of course, we are also concerned about this issue, one of the major objectives for the next period being to identify such solutions and reduce the carbon footprint, so as to respect the directions set by the Green Deal Environmental Pact."*
>
> Chief Executive Officer of the Energy Distributor[ix]

Legal Obligations

Legally, the energy distributor was only required to provide energy consumption data to the energy suppliers and not the final consumer of the energy. The provision of consumption data to the energy suppliers from the energy distributor allowed the energy suppliers to produce the invoice that they would send as a bill to the final consumer of the energy – in this case, the Municipality of Cluj-Napoca. Because of this legal obligation, the only party the energy distributor was required to provide automatic transfers of data was to the energy suppliers. Since the energy distributor was state-owned and the legislation did not require them to provide the automatic transfer of data, the energy distributor was financially restricted, in the sense that, they could not justify spending more resources on tasks that were not within their original agreed upon budget and assignments outside of legal obligations.

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The Cluj-Napoca Pilot Team

The Cluj-Napoca team's technology specialist knew they could surpass the financial challenge that the energy distributor was facing by generating an online protocol that would allow the data to be automatically fed from the energy distributor's server to the Cluj-Napoca pilot team's server (The Energy Dispatch) and subsequently uploaded into the Energy Dashboard. Therefore, they would not endure increased costs due to the solution. The only thing the team needed was the agreeance for the automatic transfer to this data.

The Cluj-Napoca pilot team was stacked with a diversity of skills and access to various networks of influence. Mihai Barbu was an employee at the Municipality of Cluj-Napoca, based at Cluj-Napoca's city hall. He had close connections to local politicians and started to think of the ways he could potentially leverage their influence and networks to make the case for the Energy Dashboard and to loosen the energy distributor's grip on their consumption data. The pilot also had an Influential Association for Electronic Industry and Software on its team who were the technology specialists that could develop the online protocol for the Energy Dispatch. This organisation had the technical skillset to develop innovative solutions and to build important partnerships within the field of sustainability. They were also experienced in lobbying state authorities, having a strong influence as leaders of the IT&C industry in not only Cluj-Napoca, but also in Romania. Lastly, the third organisation on the team was a research institute who offered a network of highly skilled researchers in the field of Alternative Energies. This research team was interested in photovoltaic-solar energy conversion, concentrated solar energy, lead-acid batteries, wind energy, hydroelectric energy, energy recovery from mechanic vibration and electromagnetic pollution (electro smog), thin layer thermoelectric transducers, unconventional treatments in microwave field, and fuel oil recovery from waste oils. They were focused and specialised in two main research topics: (1) cogeneration of energy from multiple sources and (2) research, methods, and techniques for capturing, converting and storing for alternative energies. They had been developing a multitude of Alternative Energy prototypes throughout the years and had many interesting projects on the go.

Circular Convincing in Cluj-Napoca

With this arsenal of knowledge, Mihai needed to come up with the next steps for the Cluj-Napoca pilot team. With a deadline for the development of the Energy Dashboard in a month, they needed to act fast. Otherwise, they risked not delivering on what they were obliged to produce in the REFLOW project – a technological prototype solution. Mihai took stock of his stakes, the situation, and what his team could offer. He needed to ensure that his team could deliver on a technological solution that would support the city's energy transition and reduce the increasing trend of energy

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consumption and waste. For him, the Energy Dashboard had been this solution. But with the delays and rejections involved with the solution's development, there were many things that Mihai needed to consider: the energy distributor had said no, but was there a way to convince them? The energy suppliers could provide data automatically, but this was extremely time consuming and would not necessarily lead to a viable and sustainable long-term solution, but it would cover what the team needed to deliver within the timeframe of the REFLOW project. Were there other avenues that Mihai could consider based on the competences of their pilot team? With only one month to go, Mihai needed to ensure that he made the right decision.

End Notes

[i] Reference to the 2021 – 2030 Integrated National Energy and Climate Plan (2020). https://ec.europa.eu/energy/sites/default/files/documents/ro_final_necp_main_en.pdf.

[ii] See the Sustainable Energy Action Plan 2011-2020 Cluj-Napoca, Romania for more details. Access here: https://mycovenant.eumayors.eu/docs/seap/2925_1358498277.pdf.

[iii] Nordic Innovation. (2021). *Data Sharing for a circular economy in the Nordics*. http://norden.diva-portal.org/smash/get/diva2:1612604/FULLTEXT01.pdf.

[iv] Barriers on data sharing have been extracted from Nordic Innovation's report on Data sharing for a circular economy in the Nordics. Nordic Innovation. (2021). *Data Sharing for a circular economy in the Nordics.* http://norden.diva-portal.org/smash/get/diva2:1612604/FULLTEXT01.pdf.

[v] European Commission. (2022). *Romania Historical development*. Eurydice. https://eacea.ec.europa.eu/national-policies/eurydice/content/historical-development-64_en.

[vi] International Trade Administration. (2021). *Romania – Country Commercial Guide, Market Challenges*. https://www.trade.gov/country-commercial-guides/romania-market-overview.

[vii] Based on information from the Electrica webpage. https://www.electrica.ro/en/.

[viii] See the Electrica webpage "About" for more details. https://www.electrica.ro/en/the-group/about/.

[ix] From Electrica's Sustainability Report 2019. https://www.electrica.ro/wp-content/uploads/2020/06/Electrica-Raport-sustenabilitate-EN_30.06-web-1.pdf.

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